B.Tech Third Year (Odd Semester)						
Scheme (Batch 2016-17) Computer Science and Engineering						
Sr.No.	**Course Code**	**Course Name**	**L**	**T**	**P**	**Credit**
1	CS3CO10	Theory of Computation	3	1	0	4
2	CS3CO11	Software Engineering	3	0	2	4
3	CS3CO12	Computer Networks	3	1	2	5
4	CS3CO13	Design and Analysis of Algorithms	3	1	2	5
5	CS3E*XX	(Elective-2)	3	0	0	3
6	CS3E*XX	(Elective-3)	3	0	0	3
7	EN3MC04	Human Values & Ethics	2	0	0	0
		Total	**20**	**3**	**6**	**24**
		Total Contact Hours	29			

CS3EL04	Distributed Systems
CS3EW01	Internet and Web Technology
CS3EA01	Artificial Intelligence
CS3EA02	Digital Image Processing

Course Code	Course Name	Hours per			Total
		L	T	P	Credits
CS3CO10	Theory of Computation	3	1	0	4

Prerequisite:
Students should have a background in discrete mathematics, data structures, and programming languages.

COURSE CONTENTS

UNIT I Finite Automata and Regular Languages
Motivation for studying theory of computation, Notion of formal languages and grammars, Kleene's Closure, Regular Expressions and Regular languages, closure properties of regular languages, Finite Automata. Finite Automata with output: Mealy and Moore machines, applications.

UNIT II Nondeterminism and Minimization
Nondeterministic Finite Automata, Acceptance condition. Kleene's Theorem, Myhill-Nerode relations, Minimization Algorithm, Non-Regular languages, Pumping Lemma for regular languages.

UNIT-III Grammars and Context-Free Languages
Grammars and Chomsky Hierarchy, Context-Free Grammars, Context-Free Languages (CFLs), Inherent Ambiguity of CFLs, closure properties of CFLs, eliminating useless symbols; null-productions; and unit productions, Chomsky Normal Form, Greibach Normal Form, Cock-Younger-Kasami(CYK) Algorithm, Applications to Parsing.

UNIT-IV Pushdown Automata
Pushdown Automata (PDAs), PDAs vs CFLs. Deterministic PDAs and CFLs, applications, notion of acceptance for PDAs: acceptance by final states, and by empty stack; the equivalence of the two notions, Proof that CFGs generate the same class of languages that PDAs accept, Pumping Lemma for CFLs.

UNIT-V Turing Machines and Computability
Introduction to Turing Machines, Configurations, Halting vs Looping, Turing computability, Nondeterministic, multitape and other versions of Turing machines. Church's thesis, Universal Turing Machines, Linear Bounded Automata (LBAs) and context-sensitive languages, Recursive and Recursively enumerable languages, Undecidability of Halting Problem and unsolvable problems about Turing Machines, the diagonalization language and proof that it is not Recursively enumerable.

Text Books

1. Peter Linz, An Introduction to Formal Languages and Automata, Jones & Bartlett Learning, Canada.
2. John C. Martin, Introduction to Languages and the Theory of Computation, Tata McGrawHill.

Reference Books

1. J.E. Hopcroft, Rajeev Motwani and J.D. Ullman, Introduction to Automata, Languages and Computation, Pearson Education, Asia.
2. Daniel I.A. Cohen, Introduction to Computer Theory, John Wiley.
3. H.R. Lewis and C.H. Papadimitrou, Elements of the Theory of Computation, Prentice Hall Inc.

Course Code	Course Name	Hours per			Total
		L	T	P	Credits
CS3CO11	Software Engineering	3	0	2	4

UNIT I

Software Engineering – Definition, Process, Evolution and Myths, Generic Process Model, Framework, Process Models – Waterfall, Incremental, Evolutionary, Spiral, Component Based Model, Rational Unified Process

UNIT II

Requirement Analysis, Stakeholders, Elicitation Techniques, Requirement Modelling - Use Cases, Activity Diagrams, Swimlane Diagrams, Data Modelling, Data Flow Diagram, Overview of Class Based Modelling, requirement Tracking

UNIT III

Principles of Software Design, Design Concepts – Abstraction, Architecture, Modularity, Relationships, Design Model, Component Design, User Interface Design, Configuration Management

UNIT IV

Software Quality, Approaches for Quality Assurance, Software Testing, Verification and Validation, Types of Testing, Risk Assessment, Risk Mitigation, Monitoring and Management

UNIT V

Software Metrics, Process Metrics, Product Metrics, Function Oriented Metrics, Software Project Estimations, Function Point Based Metrics, COCOMO Models, Project Scheduling, Effort Distribution

Text Books

1. Roger S. Pressman, Software Engineering: A Practitioner's Approach, McGraw-Hill.
2. Ian Sommerville, Software Engineering, Pearson Education

Reference Books

1. Rajib Mall, Fundamentals of Software Engineering, PHI
2. Hans Van Vliet, Software Engineering: Principles and Practices, John Wiley Sons
3. Richard Fairley, Software Engineering Concepts, Tata McGraw Hill
4. Robert C. martin, Agile Software Development, Principles, Patterns, and Practices, Pearson

Course Code	Course Name	Hours per			Total
		L	T	P	Credits
CS3CO12	Computer Networks	3	1	2	5

PREREQUISITE

The students should have thorough exposure in Analog and Digital Communication and Data Communications. Knowledge of Topology and protocol will help in better understanding.

UNIT-I

MAC Sublayer: Static and Dynamic Chanel Allocation in LAN, MAC protocols- ALOHA and Slotted ALOHA, CSMA, CSMA/CD, CSMA/CA, Collision Free protocols, Limited Contention Protocols. Ethernet-Ethernet Cabling, Frame Format, Binary Exponential Back-off Algorithm, Ethernet Performance, Fast and Gigabit Ethernet, MAC address, LLC Protocol, Bridges, Performance Issues in LAN-The Effect of Propagation Delay and Transmission Rate.

UNIT-II

Network Layer: Design issues, Routing algorithms: Dijkstra's algorithm, Bellman-ford algorithm, Link State Routing, Hierarchical Routing, Broadcast Routing, Multicast Routing, Congestion Control Algorithms: General Principles of Congestion control, Prevention Policies, Congestion Control in Virtual-Circuit Subnets, Congestion Control in Datagram subnets. QOS-techniques for achieving good QOS, Traffic Management, Integrated and Differentiated Services. RSVP.

UNIT-III

Internetworking, Tunnelling, Fragmentation and Reassembly. IP protocol, IPv4 Addresses, Subnet Addressing, Subnet Mask, Supernetting CIDR, NAT, ICMP-header, message type, trace route, ping program, ARP & RARP, BOOTP and DHCP: Address allocation, configuration & packet format, OSPF and BGP, Comparative study of IPv4 & IPv6, VPN and IP Security, IGMP, MPLS.

UNIIT-IV

Transport Layer: Design Issues, Transport Service Primitives, Socket Programming, TCP: Connection Management, Reliability of Data Transfers, TCP Flow Control, TCP Congestion Control, TCP Header Format, TCP Timer Management. UDP: Header Format, RPC, RTP, Per-Segment Checksum, Carrying Unicast/Multicast Real-Time Traffic. Network Performance Measurement. Session layer: Authentication, Authorization, Session layer protocol (PAP, SCP, H.245).

UNIT-V

Presentation layer: Data conversion, Character code translation, Presentation layer protocol (LPP, Telnet, X.25 packet Assembler/Disassembler). Application Layer: WWW Architectural Overview, URL-Static and Dynamic Web, FTP, SSH, Email- Architecture and Services, user agent, Message Format, SMTP, DNS-Name System, Resource Records, Name Servers, Network Management (SNMP).

Text Books

1. Andrew S. Tanenbaum, Computer Networks, Pearson Education
2. Behrouz A. Fourouzan, Data Communication and Networking, Mc Graw Hill Publication

Reference Books

1. William Stallings, Data and Computer Communication, Pearson Education
2. Alberto Leon-Garcia & IndraWidjaja, Communication Networks-Fundamental concepts and key Architecture, TMH
3. Aftab Ahmad, Kluwer, Data Communication Principles for fixed and wireless networks, Academic Publishers.
4. Gilbert Held, Data Communications Networking Devices: Operation, Utilization, Lan and Wan Interworking, John Wiley and Sons.

Course Code	Course Name	Hours per Week			Total
		L	T	P	Credits
CS3CO13	Design and Analysis of Algorithms	3	1	2	5

UNIT-I Introduction to Algorithms

Algorithms, Analysis, Performance issues: Time and Space complexity; Asymptotic Notations.

Mathematical preliminaries: functions & their growth rates; Recurrence relations, Methods for solving recurrences. Elementary Sorting techniques and its analysis: Selection, Bubble, Insertion sort

UNIT-II Sorting and Divide & Conquer

Advance sorting techniques and its analysis: Heap sort, Radix sort and Bucket sort, Divide and Conquer techniques and its analysis - Binary search, Merge Sort, Quick sort, Strassen's Matrix multiplication

UNIT-III Greedy Algorithms

Greedy problems and its complexity analysis: Optimal merge patterns, Huffman coding, Minimum spanning trees, Knapsack problem, Job sequencing with deadlines, Single source shortest path problem - Dijkstra's Algorithm.

UNIT-IV Dynamic Programming

Dynamic programming problems and its complexity analysis: 0/1 Knapsack, Multistage graph, Single source shortest path algorithm-Bellman Ford Algorithm, Reliability design, Floyd-Warshall algorithm, Matrix Chain Multiplication, Longest Common subsequence.

UNIT-V Backtracking and Branch & Bound

Backtracking Approach: N-Queen's problem, Hamiltonian cycle, Graph coloring problem, Sum of Subset problem. Introduction to branch & bound method, examples of branch and bound method like15 puzzle traveling salesman problem, 0/1 knapsack. An introduction to P, NP, NP Complete and NP hard problems.

Text Books

1. Thomas H Cormen, Charles E Lieserson, Ronald L Rivest and Clifford Stein, Introduction to Algorithms, Second Edition, MIT Press/McGraw-Hill
2. E. Horowitz, S. Sahni, S Rajasekaran, Computer Algorithms, Galgotia Publications

Reference Books

1. Saara Base, Computer Algorithms: Introduction to Design and Analysis, Addision Wesley.
2. A V Aho, J E Hopcroft & J D Ullman, The Design and Analysis of Computer Algorithms, Addison Wesley.
3. George Polya, How to Solve It, Princeton University Press
4. Anany Levitin, Introduction to the Design and Analysis of Algorithm, Pearson Education.

Course Code	Course Name	Hours per Week			Total
		L	T	P	Credits
EN3MC04	Human Values & Ethics	2	0	0	0

UNIT I Human Values

Introduction

Important Human Values: Trust, Honesty, forms of Dishonesty, Courage, Integrity, Kindness, Humility, Gratitude, Hope, Perseverance, Empathy and Compassion.

Values in Engineering Profession: Safety, Risk, Accidents, Human progress; Clean, Clear, Decision Making; Community, Partnership with Nature. Commitment and Cooperation.

UNIT II Ethics and Ethical Theories

Morality and moral systems, Introduction to Ethics, Consequentiality and Non-consequentiality theories, Hedonism, Utilitarianism, Deontological theories , Ethical Rules (with reference to W D Ross), Situation Ethics, Virtue Ethics

UNIT III Ethics in Engineering Profession

Introduction, Historical context of ethics, Definition of Profession, Engineering and Professionalism, Professional Ethics, Engineering Ethics, Role and Responsibilities of Engineers, Working towards Safety, Sample Code of Ethics for Engineers, National Society of Professional Engineers (NSPE).

Practicing ethics as an engineering student: Plagiarism & Cheating, Academic Dishonesty and Cheating v/s Teamwork.

UNIT IV Decision Making

Decision Making, Characteristics of Decision Making, Advantages of Decision Making, Steps Involved in Decision Making Process.

UNIT V Ethics in the Indian Tradition and some Case Studies

Contribution of Moral Thinkers: Indian Moral Thinker, Western Moral Thinker.

Case studies on human values and engineering ethics.

Case studies on decision making in engineering ethics.

Text Book

1. Simon Blackburn, The Oxford dictionary of philosophy, Oxford University Press.
2. Anthony Weston, A 21st Century Ethical Toolbox, Oxford University Press.
3. John Hospers, An introduction to philosophical analysis, Allied Publishers Private Limited.

References

1. W.K Frankena, Ethics, Prentice Hall of India.
2. John Hospers, An Introduction to Philosophical Analysis, Allie Publishers.
3. LaFollette Hugh, Ethics in Practice: An Anthology, Cambridge, Blackwell.

Web Sources

1. http://ethics.sandiego.edu/
2. http://www.bbc.co.uk/ethics/introduction/
3. http://plato.stanford.edu/

Course Code	Course Name	Hours per			Total
		L	T	P	Credits
CS3EW01	Internet and Web technology	3	0	0	3

UNIT – I

Introduction: Concept of WWW, HTTP Protocol: Request and Response, Web browser architecture and Web servers and Application server, Features of Web 2.0, Internetworking with TCP/IP, basics of DNS, SMTP, POP3.

UNIT - II

Web Design: Concepts of effective web design, Planning and publishing website, Introduction to web architecture, HTML: list, tables, images, frames, forms, Document type Definition (DTD), Document Object Model (DOM), Cascading Style Sheets and their types, Java Script: Introduction, documents, forms, statements, functions, objects.

UNIT - III

Introduction to XML, XML vs HTML uses of XML, simple XML, XML key components, DTD and Schemas, embedding XML into HTML documents, Transforming XML using CSS, XSL and XSLT.

UNIT - IV

PHP: working with variables and constants, controlling program flow, working with functions, arrays, files and directories, working with forms and databases, Introduction to Servlet, Lifecycle, API, and Servlet Packages.

UNIT - V

Introduction to Java Server Page (JSP), JSP Application Design, JSP objects, Conditional Processing, Declaring variables and methods, sharing data between JSP pages, Sharing Session and Application Data, Database Programming using JDBC, web application framework, MVC framework, Introduction to bootstrap, angular JS.

Text Books

1. J. C. Jackson, Web Technologies, A computer science perspective, Pearson Education.
2. Black Book, Web Technologies, Kogent learning solutions Inc., Dreamtech Press.
3. A. S. Godbole & A. Kahate, Web Technologies: TCP/IP Architecture, and Java Programming, TMH.

Reference Books

1. Ralph Moseley and M. T. Savaliya, Developing Web Applications, Wiley-India.
2. Paul S. Wang Sanda, S Katila, An Introduction to Web Design, Programming, CENGAGE Learning.
3. P.J. Deitel& H.M. Deitel, Internet and World Wide Web How to program, Pearson.

Course Code	Course Name	Hours per Week			Total
		L	T	P	Credits
CS3EL04	Distributed Systems	3	0	0	3

UNIT I

Introduction: Definition, Design Issues, Goals, Types of distributed systems, Centralized Computing, Advantages of Distributed systems over centralized system. Limitation of Distributed systems Architectural models of distributed system, Client-server communication, Introduction to DCE

UNIT II

Distributed Objects and Remote Invocation: Communication between distributed objects Remote procedure call, Events and notifications, operating system layer Protection, Processes and threads, Operating system architecture. Introduction to Distributed shared memory, Design and implementation issue of DSM.Case Study: CORBA and JAVA RMI.

UNIT III

Clock synchronization: Clocks, events and process states, synchronizing physical clocks, Logical time and logical clocks, Lamport's Logical Clock, Global states, distributed mutual exclusion algorithms: centralized, decentralized, distributed and token ring algorithms, election algorithms, Multicast communication.

UNIT IV

Distributed File Systems: File service architecture, Distributed File Systems Implementation, Naming System, Network File System (NFS), Flat and nested distributed transactions, Atomic commit protocols, Concurrency control in distributed transactions, Distributed deadlocks.

UNIT V

Scheduling -Issues in Load Distributing, Components for Load Distributing Algorithms, Different Types Distributed of Load Distributing Algorithms, Fault-tolerant services Highly available services, Introduction to Distributed Database and Multimedia system

Text Book

1. G. Coulouris, J. Dollimore and T. Kindberg, Distributed Systems: Concepts and design, Pearson.
2. P K Sinha, Distributed Operating Systems: Concepts and design, PHI Learning.

Reference Book

1. Tanenbaum and Steen, Distributed systems: Principles and Paradigms, Pearson.
2. Sunita Mahajan & Shah, Distributed Computing, Oxford Press.
3. Liu M.L., "Distributed Computing, Principles and Applications", Pearson education
4. Nancy A Lynch, "Distributed Algorithms", Morgan Kaufman Publishers

Course Code	Course Name	Hours per Week			Total
		L	T	P	Credits
CS3EA01	Artificial Intelligence	3	0	0	3

UNIT I Introduction to artificial intelligence, various types of production systems, Characteristics of production systems, Study and comparison of breadth first search and depth first search techniques.

UNIT II Optimization Problems: Hill-climbing search Simulated annealing like hill Climbing, Best first Search. A* algorithm, AO* algorithms etc, and various types of control strategies, Heuristic Functions, Constraint Satisfaction Problem.

UNIT III Knowledge Representation, structures, Predicate Logic, Resolution, Refutation, Deduction, Theorem proving, Inferencing, Semantic networks, Scripts, Schemas, Frames, Conceptual dependency.

UNIT IV Uncertain Knowledge and Reasoning, forward and backward reasoning, monotonic and nonmonotonic reasoning, Probabilistic reasoning, Baye's theorem, Decision Tree, Understanding, Common sense, Planning.

UNIT V Game playing techniques like minimax procedure, alpha-beta cut-offs etc, Study of the block world problem in robotics.

Text Books

1. Elaine Rich, Kevin Knight and Nair, Artificial Intelligence, TMH
2. Peter and Norvig, Artificial Intelligence: A Modern Approach, Prentice Hall

Reference Books

1. Saroj Kausik, Artificial Intelligence, Cengage Learning
2. Padhy, Artificial Intelligence and Intelligent Systems, Oxforfd University Press,
3. Nils Nilsson, Artificial Intelligence: A New Synthesis, Morgan Kaufmann.
4. David Poole, Alan Mackworth, Artificial Intelligence: Foundations for Computational Agents, Cambridge Univ. Press.

Course Code	Course Name	Hours per Week			Total
		L	T	P	Credits
CS3EA02	Digital Image Processing	3	0	0	3

UNIT I

Imaging, Digital Image Processing, Fundamental Steps in Image Processing, Components of Image Processing System, Elements of Visual Perception, Structure of Human Eye, Image Sensing and Acquisition, Image Sampling and Quantization

UNIT II

Imaging Geometry, Digital Geometry, Image Acquisition Systems, Different types of digital images Introduction to Fourier Transform and DFT, Properties of 2D Fourier Transform, FFT, Separable Image Transforms, Walsh – Hadamard, Discrete Cosine Transform, Haar, Slant – Karhunen – Loeve transforms.

UNIT III

Basic Grey Level Transformations, Histogram Processing, Spatial Filtering, Smoothing Spatial Filters, Sharpening Spatial Filters, Combining Spatial Filter Methods, Segmentation of Grey Level Images, Water Shade Algorithm, Fuzzy Techniques for Intensity Transformation and Spatial Filtering

UNIT IV

Color Image Processing, Color Models and Representation, Laws of Color Matching, Chromaticity Diagram, Color Enhancement, Color Image Segmentation, Color Edge Detection

UNIT V

Image Compression: Lossy and Lossless Compression Schemes, Prediction Based Compression Schemes, Vector Quantization, Sub-Band Encoding Schemes, JPEG Compression Standard, Fractal Compression Scheme, Wavelet Compression Scheme, Fundamentals of Redundancies, Basic Compression Methods: Huffman Coding, Arithmetic Coding, LZW Coding, JPEG Compression Standard

Text Book

1. Rafael C. Gonzalez, Richard E Woods, Digital Image Processing, Prentice Hall
2. Maria Petrou and Costas Petrou, Image Processing the Fundamentals, John-Wiley and Sons

Reference Book

1. Tinku Acharya and Ajoy K. Ray, "Image Processing Principles and Applications", John Wiley & Sons
2. R.J. Schalkoff, Digital Image Processing and Computer Vision, Wiley
3. K.S. Fu and T.Y. Young, Handbook of Pattern Recognition and Image Processing, Academic Press
4. John C. Russ, The Image Processing Handbook, CRC Press SIUE Library call